Dual Strike Documentation

http://www.zurborg.info

This is the documentation for the Dual Strike with firmware version 3.2.

IMPORTANT: For the MAME and XBox working modes an ATmega168 microcontroller (like on the Dual Strike V2) is required. The Dual Strike V1 boards come assembled with a ATMega8 microcontroller, but can be upgraded with a ATMega168 (available on http://www.arcadeforge.de). The Dual Strike SMD does not support MAME and XBox.

Introduction

The Dual Strike PCB is a completely solderless controller board for your arcade stick. Every connection to buttons or directions screw in directly to the side of the board, so installation requires nothing more than a screwdriver. The Dual Strike works on any PC (including Windows 7/Vista/XP/2K/98, Mac OS and Linux) as well as Playstation 3 systems. It also has a pass-through dual mod function supporting USB interfaces (or similar) like XBox360 or Dreamcast.

This makes the Dual Strike the perfect solution for customers who want to build or dual mod an arcade stick.

The pin names of the Dual Strike are written in *italics* throughout this document.

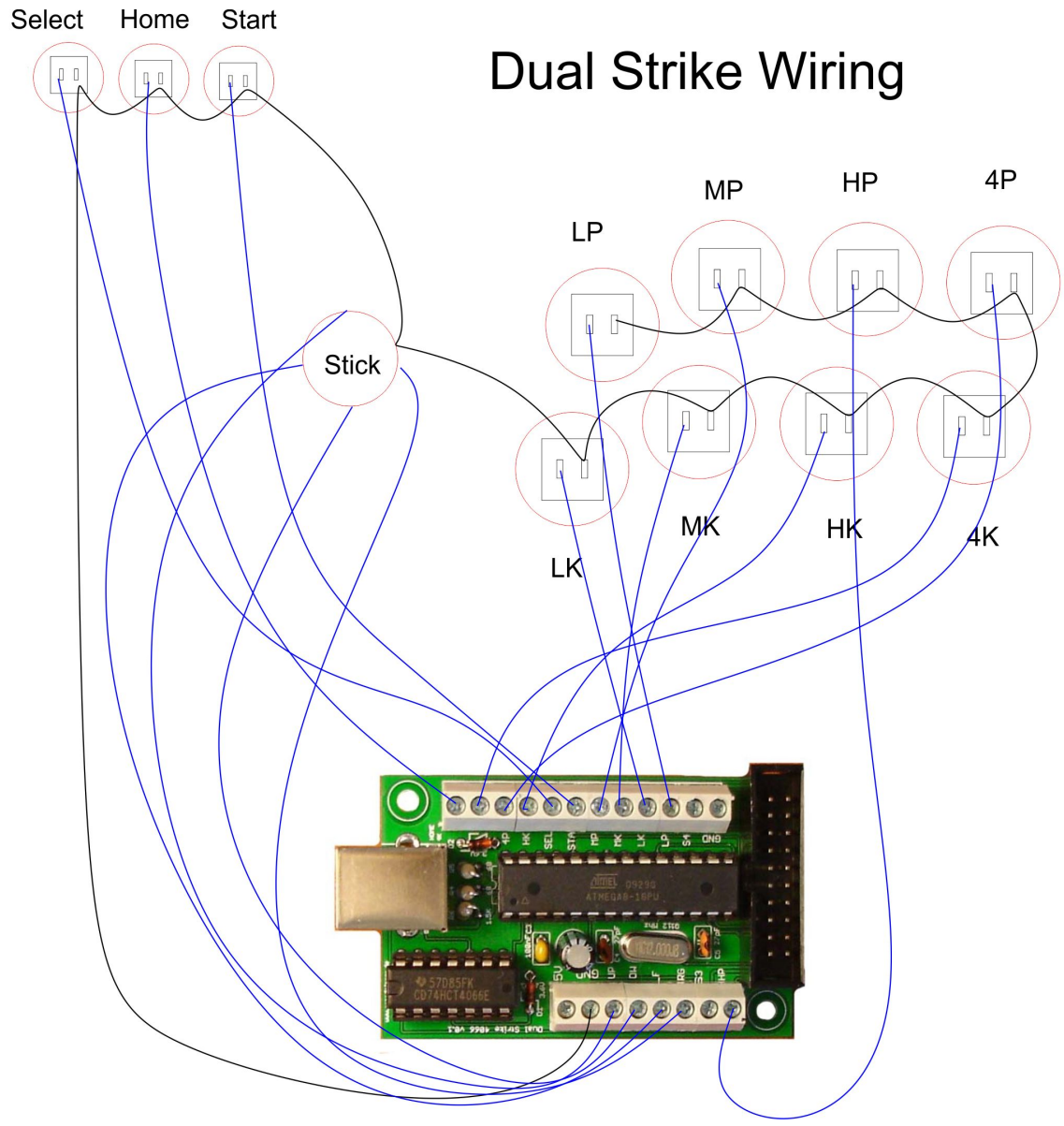
Features

- Software:
    - Auto-detect of connected game console: PS3, XBox one, PC or pass-through PCB (normally Xbox360)
    - Works as a game controller on Playstation 3:
        - PS is supported and can be emulated, too (configurable).
        - L3 and R3 buttons are supported either by emulation or as buttons.
        - L1 and L2 can be emulated (useful for 6-button arcade stick layouts).
        - Digital Pad, LS and RS supported, changeable either by button-joystick combination or a with a dedicated switch.
    - Works as a game controller on PCs with an operating system supporting HID-compatible USB devices (including Windows 7/Vista/XP/2K/98, Mac OSX and Linux).
    - Works as a MAME keyboard encoder with four configurable button mappings selectable on runtime.
    - Works as a XBox one gamepad. Digital pad, left and right analogue joysticks supported, changeable either by button-joystick combination or with a dedicated switch.
    - Switchless or automatic selection of pass-through device:
        - Supports any USB interface (or similar) like XBox360 or Dreamcast.
        - *Home* (on XBox360 Guide) can be emulated (configurable).
        - *4K* and *4P* (on XBox360 LB and LT) can be emulated (configurable).
        - Inverted (active high) triggers or a joystick mode switch can be emulated (configurable).
    - Firmware update is supported for Windows systems, on other systems by compiling the source.
    - Configuration from a PC (needs a Java 6 Runtime Environment), works out of the box for Windows, needs custom compilation on other systems like Linux.
- Hardware:
    - 20 screw terminal ports for connecting all of your wires.
    - No soldering required.
    - USB type B jack for connecting any standard USB cable.
    - Piggyback interface for even easier installation of pass-through PCBs.
    - Integrated switch interface for USB pass-through functionality. Any two wire protcoll can be supplied to the switch.
    - Separate connection points for all power lines and signals.
    - Mounting holes for easy installation inside your arcade board.
    - Extra connectors (*S3* and *S4*) to have one of the following:
        - joystick mode switch support (like on MadCatz Fightsticks and Fightpads)
        - emulation of a joystick mode switch for the pass-through device (like MadCatz Fightstick and Fightpad PCBs)
        - pass-through PCBs with inverted (active high) triggers
        - L3/R3 Button in PS3 mode

Installation

IMPORTANT: Be sure to ground yourself before handling electronic components. This can be done for example by touching a radiator of a central heating system. Always be sure not to connect VCC and Ground to each other and not to mix these lines.

Connect all wires/pins to the buttons and the joystick and connect the USB lines to the PCB to pass through (e.g. by soldering).



Take care, the picture shows Dual Strike V1, but the wiring is similar for Dual Strike V2.

S3/S4 Functions

For the pins S3 and S4 you have four options:

- Leave them unconnected.
- Connect them to the pins of a common ground SPCO switch (S3=left stick, S3=right stick) to read the setting. These switches can be found for example on MadCatz Fightsticks, there the switch positions are labeled LS/DP/RS.
- Connect them to the pins on the pass-through PCB of a common ground joystick mode switch (S3=left stick, S4=right stick) to emulate the switch. These switches are the same as the ones mentioned directly above.
- Connect them to the trigger pins on a pass-through PCB with active high triggers (S3=left trigger, S4=right trigger).
- Connect them to common ground buttons to have dedicated L3 and R3 buttons in PS3 mode.

You have to configure which function is active from a PC with the Configuration Editor.

Startup and Working Behavior

Mode Selection

The Dual Strike offers different working modes for playing games as well as the configuration mode to change settings and the firmware update mode to install a newer (or older) software on the Dual Strike. The working modes are PS3 gamepad, PC gamepad, MAME keyboard encoder, XBox1 gamepad and pass-trough (e.g. XBox360). The working modes can be en- and disabled using the Configuration Editor and it can be chosen if auto-detection or a default working mode is entered.

If no button is pressed on activating the Dual Strike (e.g. by plugging in):

- if auto-detection is enabled it tries to detect which working mode to use in the sequence PS3→PC→XBox→pass-through for enabled working modes (may take some seconds)
- otherwise it enters the set default working mode

By pressing a button or joystick direction while the Dual Strike gets activated, it can be set into the different modes:

- If the *Select* button is pressed, then configuration mode is entered.
- If the *Start* button is pressed, then firmware update mode is entered.
- The working modes can be activated as follows:
    - If only one working mode is enabled, then this working mode will be activated in any case.
    - If two working modes are enabled and one of the buttons *LK*, *MK*, *LP*, *MP*, *HP* and *4P* is pressed, then the non-default mode is activated.
    - If more than two working modes are enabled,:
        - the button *LK* is pressed and the PS3 mode is enabled, then the PS3 mode is activated.
        - the button *MK* is pressed and the MAME mode is enabled, then the MAME mode is activated.
        - the button *HK* is pressed and the PC mode is enabled, then the PC mode is activated.
        - the button *LP* is pressed and the XBox mode is enabled, then the XBox mode is activated.

        - the button *MP* is pressed and the pass-through mode is enabled, then the pass-through mode is activated.

Meta Button

To allow for changing the behavior of the Dual Strike while it is plugged in one button is designated the "Meta" button. Pressing it and special buttons or joystick directions changes the Dual Strike's behavior depending on the active working mode and the configuration settings. The Meta button can be either *Start* (default) or *Select*, use the Configuration Editor to change this. If the Meta button functionality is active, that is in the current working mode with the current settings a combination using the Meta button is available, the data for this button is only sent to the host on release if no combination containing the Meta button was pressed.

Joystick Function/MAME Mode Switching

The joystick works either as a digital pad (factory default), left analogue stick or right analogue stick in the PS3 and XBox working modes. In the MAME working mode there are three modes, the game modes for player 1 and 2 and the control mode. You have different options how to set or change these modes:

- Change the default joystick/MAME player mode with the configuration editor.
- On startup press a joystick direction to select a joystick mode, MAME starts in the default player mode:
    - *Up*:digital pad
    - *Left*: left analogue joystick
    - *Right*: right analogue switch
- If activated in the configuration (default is disabled), you can use on-the-fly joystick and MAME mode switching. See the table below for the button-joystick-combination to use.
- If joystick switch reading is activated, the setting of the switch determines which joystick behavior/MAME mode is active.

On-the-Fly-Switching: Meta+	**SPDT Switch Setting** (connected against ground)	**PS3 and XBox Joystick Behavior**	**MAM**
Up [precedence]		digital pad [default]	control mode
Left	S3	left analogue stick	player 1 gam
Right	S4	right analogue stick	player 2 gam

Configuration Editor

In the configuration mode the behavior of the Dual Strike can be changed. While plugging in the USB Cable press *Select* to enter it, leave it by pressing *Start*. With the configuration editor you can adjust the settings of the Dual Strike. Configurations can be loaded from and saved to the Dual Strike as well as files. See the tooltips for additional help on controls and settings.
To run the configuration editor you need a Java 6 Runtime Environment (for example Oracle Java) installed on your PC. It is assumed that the Java executables are in the path (this is

most probably the case). You also need to download the configuration editor and unpack the archive. Non-Windows users please read `mcc_Readme.txt` for how to compile the operating system dependent part.
To start the configuration editor on Windows double-click on the batch file for your device, see the table below. On other systems execute the command `java -jar mcc-1.1.0.jar <Configuration Definition>` in the directory with the configuration editor files, where `<Configuration Definition>` is the file name mentioned in the following table.

Dual Strike Type	Batch File (Windows)	Configuration Definition
ATMega168 (like DS V2)	`configuration_editor_atmega168.bat`	`configuration_atmega168.xml`
ATMega8 (like stock DS V1) and SMD	`configuration_editor_atmega8.bat`	`configuration_atmega8.xml`

Working Modes

PS3

In the PS3 working mode the Dual Strike works as a game controller for PS3 (not on PC).

IMPORTANT: The Meta Button is activated by button release, if no combination containing it was pressed.

The joystick directions are sent to the host as either digital pad, left analogue stick or right analogue stick directions, see Joystick Function/MAME Mode Switching for how to change it.
The other mappings are:

Button	PS3	Windows
LK	×	2
MK	○	3
HK	R2	8
4K	L2	7
LP	□	1
MP	△	4
HP	R1	6
4P	L1	5
Select	Select	9
Start	Start	10
Home	PS	13

If 4P/4K emulation is activated, then Meta+*HK* means L1 and Meta+*HK* means L2.
If L3/R3 reading is not activated, then Meta+*LK* means L3 and and Meta+*MK* means R3.
Otherwise a *S3* button press means L3 and *S4* means R3.
If *Start*+*Select*=*Home* is activated, then *Start*+*Select* means PS.

PC

In the PC working mode the Dual Strike works as a game controller for PCs with an operating system supporting HID (e.g. Windows 7/Vista/XP/2K/98, Mac OSX and Linux), no separate drivers are needed. To use it the first time with enabled working mode auto-detection you have to explicitly start the PC mode to install the drivers (see Mode Selection).

The joystick directions are sent to the host as a digital pad (Windows: POV hat). The other mappings are:

Button	Windows
LK	1
MK	2
HK	3
4K	4
LP	5
MP	6
HP	7
4P	8
S3	9
S4	10
Select	11
Start	12
Home	13

MAME

In the MAME working mode (not available for ATmega8) the Dual Strike works as a HID compliant keyboard (i.e. on operating systems like Windows 7/Vista/XP/2K/98, Mac OSX and Linux) with the MAME default keys mapped to the stick buttons, thus it is a MAME keyboard encoder. Three modes are available:

- the game modes (meant for playing your games) for player 1 as well as for player 2
- and the control mode (for configuring game specific options).

To switch between them, use Meta+*Left* for player 1 and Meta+*Right* for player 2 game mode and Meta+*Up* for control mode or an appropiate switch, see Joystick Function/MAME Mode Switching for details.

IMPORTANT: The key for the Meta Button is activated by button release, if no combination containing it was pressed.

Game Modes

The inputs are generated either for player 1 or player 2.

The direction and special inputs in the game modes are:

Dual Strike	MAME	Player 1 Keyboard	Player 2 Keyboard
Up	Up	Up	R
Right	Right	Right	G
Down	Down	Down	F
Left	Left	Left	D
Select	Coin	5	6
Start	Start	1	2
Home	Pause	P	
Meta+*LK*	Enter	Enter	
Meta+*MK*	Leave/Quit	Escape	

If *Start*+*Select*=*Home* is activated, then *Start*+*Select* means P.

The standard MAME key assignments are assumed for the buttons:

MAME	Player 1 Keyboard	Player 2 Keyboard
Button 1	LCTRL	A
Button 2	LALT	S
Button 3	Space	Q
Button 4	LShift	W
Button 5	X	K
Button 6	Y	I

How these MAME buttons are mapped to the stick buttons *LK*, *MK*, *HK*, *4K*, *LP*, *MP*, *HP* and *4P* is determined by the configuration of the Dual Strike. There are four button mapping sets. A set is activated by pressing Meta+*LP* together with a joystick direction. The first is activated by *Up*, the second by *Right*, the third by *Down* and the fourth by *Left*. You can use the configuration editor to change these. The default button mappings are given below.

Default Button Layout 1

This layout is activated by pressing Meta+*LP*+*Up*.

Dual Strike	MAME
LK	Button 3
MK	Button 4
HK	Button 6
4K	
LP	Button 1
MP	Button 2
HP	Button 5
4P	

Default Button Layout 2

This layout is activated by pressing Meta+*LP*+*Right*.

Dual Strike	MAME
LK	Button 4
MK	Button 5
HK	Button 6
4K	
LP	Button 1
MP	Button 2
HP	Button 3
4P	

Default Button Layout 3

This layout is activated by pressing Meta+*LP*+*Down*.

Dual Strike	MAME
LK	Button 5
MK	Button 6
HK	
4K	
LP	Button 1
MP	Button 2
HP	Button 3
4P	Button 4

Default Button Layout 4

This layout is activated by pressing Meta+*LP*+*Left*.

Dual Strike	MAME
LK	Button 4
MK	Button 5
HK	Button 6
4K	
LP	Button 1
MP	Button 2
HP	Button 3
4P	Button 4

Control Mode

The following input mappings apply to the control mode:

Dual Strike	MAME	Keyboard
Up	Up	Up
Right	Right	Right
Down	Down	Down
Left	Left	Left
LK	Test	F2
MK	Reset	F3
HK		
4K		Volume Down
LP	Enter	Enter
MP	Leave	Escape
HP		
4P		Volume Up
Select	Service Coin	9
Start	Menu	TAB
Home		

XBox

In the XBox working mode (not available for ATmega8) the Dual Strike works as a game controller for the XBox one (with a adapter from USB to XBox or a XBox cable connected to the USB lines) but NOT for PC with appropiate drivers (e.g. XBCD). The joystick directions are sent to the device as either digital pad, left analogue stick or right analogue stick directions, see Joystick Function/MAME Mode Switching for how to change it.

IMPORTANT: The key for the Meta Button is activated by button release, if no combination containing it was pressed. It is working normal if a joystick mode switch is used and 4P/4K emulation is not enabled.

The other mappings are:

Button	PS3	Windows
LK	A	1
MK	B	2
HK	White	6
4K	RT	12
LP	X	3
MP	Y	4
HP	Black	5

4P	LT	11
Select	Back	8
Start	Start	7
Home		

XBox-to-USB Adapter

You need an adapter to connect a Dual Strike to a XBox. Below are some tables explaining the different lines, the mentioned colors might differ. If you are unsure which connectors/ plugs you have or which lines to connect, please read more about USB (e.g. USB standard connectors in the USB article in Wikipedia) and XBox connectors (e.g. this Guide for building a XBox-to-USB adapter) or buy a preassembled adapter.

XBox connector as seen when looking at the plug:

VCC (red)	Data- (white)	Data+ (green)	Video Sync (yellow)	Ground (black)

USB type A connector as seen when looking at the plug:

VCC (red)	Data- (white)	Data+ (green)	Ground (black)

USB type B connector as seen when looking at the plug:

VCC (red)	Data- (white)
Data+ (green)	Ground (black)

Pass-Through

In the pass-through mode the USB connector data lines are routed to the D+ and D- pins and thus a properly connected PCB will be used by the host device (like a PC or gaming console).
If *Start*+*Select*=*Home* is activated, then *Start*+*Select* makes the *Home* pin low (activating this button for a connected common ground PCB), otherwise it is high.
If inverted triggers are activated and *HK* or *HP* is pressed, then S3 or S4 respectively are pulled high (activating connected active high trigger pins), otherwise they are low.
If *4K/4P* emulation is activated, then Meta+*HK* pulls *4K* and *Start*+*HK* pulls *4P* low (making these buttons pressed for a connected common ground PCB).
If joystick switch emulation is enabled, S3 is pulled low if the left analogue joystick is activated (by pressing Meta+*Left*), S4 is pulled low if the right analogue joystick is activated (by pressing Meta+*Right*) or both pins are left alone if the digital pad is activated (by pressing Meta+*Up*).
See Configuration Mode and Joystick Function for more details.

Firmware Update

Firmware update is supported for Windows systems, it is possible on other systems like Linux with custom compilation.
To update the firmware of your Dual Strike execute the following steps (assuming you already downloaded and unpacked the firmware update archive and you are using a Windows system):

1. Press and hold *Start* while plugging in to switch to the firmware update mode.
2. On Dual Strikes with ATmega168 (like V2) you can release *Start*, on others hold it until firmware update is finished.
3. Execute the firmware update batch file (see below).
4. On Dual Strikes with ATmega8 release *Start*.
5. After updating the firmware from firmware versions prior to version 2 enter configuration mode and load the defaults. If updated from firmware version 2 the defaults are automatically loaded, so you might have to reconfigure.

The firmware update files are the following:

Dual Strike Type	Filename
ATMega168 (like DS V2)	`update_firmware_168.bat`
ATMega8 (like stock DS V1)	`update_firmware.bat`
SMD	`update_firmware_smd.bat`

History

Version Number	Changes
3.2.0	• added: disabling of on-the-fly joystick/MAME mode switching (default) • improved: longer timeouts for auto-detection • updated configuration editor to version 1.2.0
3.1.0	• added: auto-detection of working mode • added: PC mode • added: Meta button selection • improved: PS3 mode is sending data in one transfer which means less lag, but the PS3 mode no longer works on PC • removed: stick based configuration • updated configuration editor to version 1.1.1
3.0.0	• added: MAME working mode (not available for ATmega8) • added: XBox working mode (not available for ATmega8) • added: disabling of working modes • added: 4K/4P emulation • added: L3/R3 support • added: on-the-fly joystick switching without dedicated switch • improved: Home button emulation for pass-through devices • improved: joystick switch emulation for pass-through devices • updated configuration editor to version 1.1
2.0.1	• fixed: default mode switching didn't work as documented • fixed: pass-through device not working after configuration mode

2.0.0	• USB configuration mode, allowing configuration from a PC
1.7.1	• Bug Fixes
1.7.0	• PS3 mode: added support for analogue button/dpad values (like in SSFIITHDR and the on-screen keyboard)
1.6.2	• merged SMD design code into source code
1.6.1	• fixed: triggers not working after being used to switch to non-default mode
1.6	• changed configuration mode behaviour again • re-introduced inverted trigger configurablity • added: joystick mode switch support • added: joystick mode switch emulation • PS3 USB polling interval is now 1ms
1.5	• changed configuration mode behaviour • added possibility to reset to the defaults
1.4	• added: right stick support • removed configuration possibility of inverted triggers
1.3	• added: configuration capabilities • PS3 Home Button support • inverted trigger support removed from build, still usable through recompilation
1.2	• HID Device extended • Inverted Trigger Support
1.1	• HID Device extended
1.0	• initial release